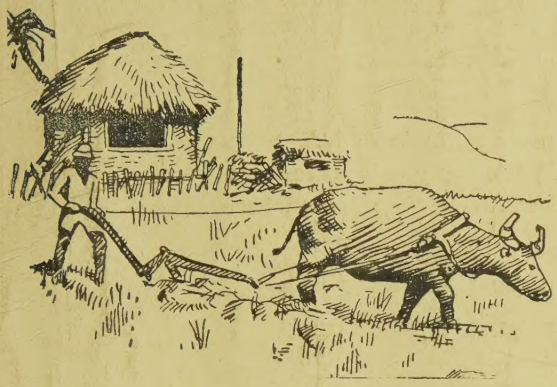
The Philippine Agriculturist and Forester



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A CALL

This journal, THE PHILIPPINE AGRICULTURIST AND FORESTER, is published by the Student Body of the College of Agriculture, a joint society of the students of the Philippine College of Agriculture.

We believe that the future of the Philippines depends upon its farms, and considering the methods of diffusing a knowledge of agriculture we endeavor to offer a paper which will prove practical to farmers and foresters; we hope it may also be useful to scientists. This, then, is our main aim in bringing forth THE PHILIPPINE AGRICULTURIST AND FORESTER.

We also realize the benefits that we can earn in preparing such a paper, not only in the knowledge of literature but also in stimulation to harder work in the field of scientific investigations. We wish our readers to partake with us of the experience we may acquire.

It is our natural desire to succeed in the humble task we have already begun. Considering our situation, we are unable to carry out our plan without the most efficient help of every friend.

The journal will be published monthly during the school-year. A year's subscription is fixed to the low price of ₱2.00. The paper is not expected to be financially profitable.

We offer gratis a subscription to the sender of ten subscriptions, or five subscriptions and a peso. This offer is of special interest to students, who with little effort may secure subscriptions from their companions.

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EARN YOUR OWN EDUCATION

With the increase in area under cultivation on the college farm, the need of a constant supply of labor has grown apace. Student labor will be used as largely as possible to satisfy this demand. There will be an opportunity during the next year for at least thirty students to earn their education in this way. It is the only chance open to any large number of students, to earn an education by practice in the same subjects in which they are educated.

DEDICATION OF MAIN HALL

THE PHILIPPINE AGRICULTURIST AND FORESTER

Vol. I. FEBRUARY, 1911 No. 2

ROOT CROPS

By "root crops" are understood those produced underground. Strickly speaking, they are usually not roots, but most often some sort of underground stem. The first number of this journal contained an account of the maniok growing on the farm. Various other crops of the same class are being tested, of which gabi and yautia are now ready for report.

The yautia, *Xanthosoma sagittifolium*, is a West Indian plant, which has been studied and described by Mr. Barrett, now of the Philippine Bureau of Agriculture. Our plants seem to be the variety called Rolliza, but they are not uniform. The "seed" was obtained from the Normal School; it is understood that the stock was imported some years ago by the Bureau of Agriculture. For local food, the yautia is one of the most important Porto Rican crops. The price is usually a little less than that of yams, but nearly double that of the sweet potato. On fairly good soil it should be planted in rows a meter apart, with the plants half a meter apart in the row.

In its habit, the plant is very like our gabi, from which it is easily distinguished by bearing sagittate, not peltate leaves. It produces a stout, erect underground stem, called the "madre." This branches freely, and the branches may grow up and produce leaves, in which case they are offsets or suckers, or they may swell and become tubers, but not produce leaves. The Rolliza is a superior variety, in that it produces many tubers, but few suckers, A few of our plants produced no suckers at all.

There is no question that the yautia is a plant well worthy of general cultivation in the Philippines. All of our present small crop is being used for "seed." When the next crop matures, we will be able to distribute a considerable amount of it. Persons desiring a few plants, to get a start, can probably secure them, as we did, from the Normal School.

The gabi, *Caladium Colocasia*, known more widely in English as taro, and in Hawaii as *poi*, is too familiar in the Philippines to need description. It stools freely here, producing both suckers and tubers, making it a much better plant than the Porto Rican variety, described by Barrett as being without tubers. The gabi of Mindoro has the reputation of being exceptionally productive; through the kindness of Governor Van Schaick, the college has this variety.

The yautia and gabi were both transplanted in July. January 31, ten plants of gabi, ten of yautia with suckers, and two of yautia without suckers were dug, washed clean, and weighed after removal of the tops. For comparison, ten plants of the local green gabi were dug in a neighboring field and treated in the same way, except that only the leaves were removed. The average weight per plant was:

Local Gabi	0.48 kilo.
Mindoro Gabi	0.72 kilo.
Yautia with suckers	1.38 kilo.
Yautia without suckers	1.40 kilo.

The madre, offsets and tubers were not separately weighed. In Porto Rico, the madre has about half the value of the tubers.

The yield of yautia with stools corresponds to 27.6 tons per hectare, the plants being one meter by one-half meter. One are of sweet potatoes was dug, washed and weighed at the same time, and the yield found to be 82 kilos, corresponding to 8.2 tons per hectare. However, the sweet potato field has by no means as good soil as the nursery in which the yautia and gabi grew. At the present tienda prices of camotes in Los Baños, the sweet potatoes would be worth 550 to 825 pesos a hectare.

—E. B. C.

TAAL AND AGRICULTURE

The very destructive eruption of Taal began with an explosion and earthquake at 2:15 a. m., January 30. The entire college was aroused instantly, and Mr. Cuzner prepared at once to take such observations as would make the catastrophe as instructive as possible.

Ashes began falling at 3:10, at the college. These were collected on a piece of paper placed in the open, and having an area of 6,072 square centimeters. The heaviest fall lasted until 5:45; the mass collected during this time weighed, air-dry, 172.9 grams, equalling 0.035 g. per sq. cm. From 5:45 to 9:15 the dust collected amounted to 0.0332 g., or 0.000546 g. per sq. cm. By this time the sky was clear, and no fall was visible. However, a clean paper was again exposed, and at 10:40 had collected very fine dust amounting to 0.0000175 g. per sq. cm. There was still some fall of dust during the day, but too little to be collected and weighed. The total measurable fall was then 0.0355635 g. per sq. cm., equalling 355.635 g. per M. sq., or 3.55635 metric tons per hectare.

A chance to see and study the effects of a great volcanic eruption is worth more than a day of class work, even if the students were not too excited to think about their usual studies. Accordingly, the students were dismissed from classes, and some eighty of them, with Mr. Cuzner, Mr. Ledyard, and the dean spent the day on a visit to Tanauan and the shore of Taal lake.

In Los Baños, the fall was appreciably heavier than at the college. In Calamba the ashes were found still heavier, amounting wet to nearly two millimeters. Above Calamba the depth increased; the first train over the line was delayed nearly an hour by the ashes on the track. At Tanauan, however, there was less dust than in Los Baños; and in Batangas no dust is said to have fallen. From Tanauan to the lake the depth gradually increased, until at Bañadero, where the road reaches the shore, the wet ashes were six to eight millimeters deep. We arrived here less than nine hours after the eruption, and so had an opportunity to observe the immediate effects.

STUDENTS WITH TAAL IN BACKGROUND

These effects fall obviously into two classes, as they are due to the composition of the deposit, or merely to its weight. The latter are of course simple and easy to understand. The storm of ashes was accompanied by rain, purely local, from the cloud thrown from the volcano. This made it in effect a fall of mud, thick and sticky enough to hold fast to leaves. A square meter of this must have weighed fifteen kilograms. Bamboos, and palms, papayas and other plants with large leaves or a great deal of foliage were bent down or broken.

ASHEN LANDSCAPE

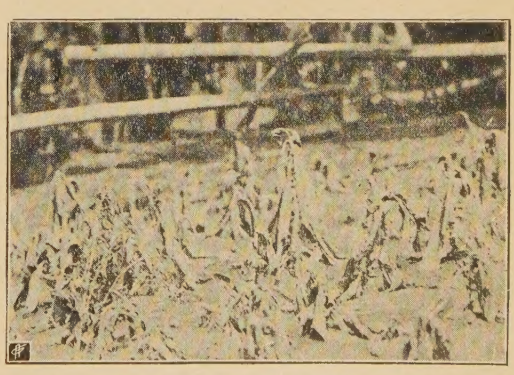
The nature of the injury not due to the mere weight of the deposit is not so simple a matter. It is agreed by all who spent the night at Bañadero that the mud which fell there was hot enough to hurt anything by its temperature. Still this injury was more severe as the distance from the volcano decreased; for instance, the damage to maize was greater at Santo Tomás than in Los Baños. The explanation is probably in the wetness of the deposit, dry ashes being harmless.

The immediate susceptibility of the foliage of different plants varied greatly. Lettuce, tomatoes, ferns and strawberries were badly damaged even at the college. Among weeds, *Amarantus* was easily killed. Other plants susceptible enough to have the foliage thoroughly destroyed near Bañadero are tobacco and papaya, and even maize. The younger leaves and growing stems of almost all plants went quickly; this was naturally most conspicuous in the case of such plants as the mango, whose newly spread leaves are much more tender than the old ones. The symptoms were always a local or general blackening, and wilting and shriveling.

It will take a thorough physiological study to establish positively the nature of this injury. In advance of such study, it seems probable that it is a poisoning due to iron. When the ashes are wet, the iron dissolves, and enters the leaves in solution if their structure permits. The brackening and death of the tissues follows of course.

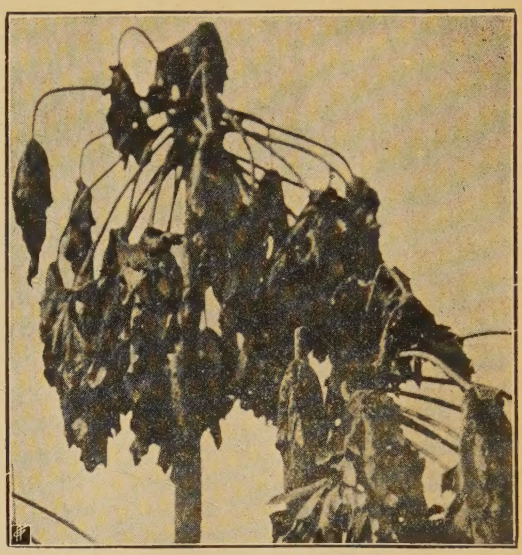
The practical situation in the district more heavily covered is this: All garden truck, including tobacco, and all food for beasts is destroyed; and almost all vegetation will probably be promptly defoliated. Bananas, papayas and fruit trees will not be killed; but it may be expected to take any of them at least six months to produce new leaves and then bear any fruit. The principal industry of this region was orange growing, and this year's crop was practically harvested and sold. There was also a considerable area near the lake in sugar; this was nearly mature, but it is doubtful if it can be cleaned enough to have any value. Maize was in all stages. By the time we reached the lake, people were already sledding maize and cane tops down to the water and washing them for fodder; only what can be handled in this way fairly

MAIZE DESTROYED BY ERUPTION



RUINED TOBACCO

ASH-COVERED CANE



PAPAYA WHERE TANAUAN STOOD

promptly has any value. The washing is of course very imperfect. The men say cattle will eat this washed fodder if they are very hungry; and they are going to be hungry enough.

The more remote agricultural effects of the eruption will be beneficial. This has been the experience in many places. At the height of the coffee days of Indang, an eruption of Taal defoliated the coffee orchards, and the planters thought they were destroyed. But the next crop was the largest they had ever harvested. The ashes contain considerable chlorine; and Mr. Cuzner points out that this will not be good for tobacco, the cultivation of which has been increasing in the orange country. Farther away from the volcano than the fall has done any considerable damage, there should still be an appreciable beneficial result from it. The iron which has already been suggested as the main cause of present non-mechanical damage may be the chief factor in the increased crops, acting as a chemical stimulant to vegetation.

The college was fortunate enough to have a considerable area of exposed, smooth concrete, washed clean. The deposit on this was collected and kept for analysis.

Experiments are also under way testing the effect of the ash, pure or mixed with soil, on plants of various kinds germinated in it or transplanted into it. This work is in Mr. Cuzner's hands, and will be the basis for a future paper, in which he will also report on the progress of defoliation and recovery in the country at present afflicted. This preliminary report is a joint product. Mr. Cuzner has contributed many of the field data, Mr. Holman, has prepared an analysis, and Mr. Ledyard the photographs.

—E. B. C.

THE DEDICATION OF OUR NEW BUILDINGS

An event the importance of which, not so much in the development of these islands as in our college life, can hardly be overestimated, took place Saturday noon, the twenty-first of May, when the permanent academic buildings of the Philippine College of Agriculture were dedicated. Members of the Board of Regents and of the Philippine Commission, Speaker Osmeña and some fifty Assembly delegates, Director White, Major Ahern, Dr. Nesom and other guests were present at the celebration, which was held in the assembly hall of the main building. This was previously decorated with ferns, *anahaw* and other plants gathered by college students from Mt. Makiling. At about twelve o'clock the special stopped at Los Baños station, and the party was taken to the farm by four automobiles, and several wagons kindly offered by the commanding officer of Camp Eldridge.

After lunch the visitors were shown our beautiful nurseries, the small plantations of

sugar cane, rice, *camoteng cahoy*, sweet potatoes, various fruits and other products raised on the college farm for experiment. They visited the new stable, the silk house, propagating house, the temporary building, the laboratory building, and the students' *barrio*.

At about one o'clock, the party, and instructors and students were gathered in the assembly hall, and the celebration was begun with the salutatory speech of the Dean.

Address of Dr. Copeland.

"Mr. Secretary, Mr. Speaker, Gentlemen of the legislature and of the Board of Regents, friends all:—

"It is my privilege and pleasure, on behalf of the College of Agriculture, to bid you welcome here. This is the first time that many of us have met, the first chance most of you have had to see what your future citizens are receiving from the funds you have seen fit to invest here. At such a time it is fitting that I should analyse the conditions which bring this college into existence, and make an accounting for the young men and funds you haye entrusted to our care.

"The Government of the Philippines uses its money for education, not because other governments have established the customs of so doing, not because the young people are eager to go to school, but because it expects thereby to improve its future citizens and make stronger the future state. The state of to-day lives but for the state of to-morrow. It will be great and honorable in the measure in which its young people are trained in strength and wisdom.

"Strength and wisdom! Let us consider these a moment. Strength, aside from wisdom, may be regarded as composed of health and wealth. The wealth of the Philippines, as you all know, is essentially what its men can take from the soil. The College of Agriculture is entitled to your generous support because, more directly and more thoroughly than any other institution under the government, it gives the men of the near future the training which will best insure the wealth of your people. The other element of strength is health, and I need present no argument to convince you that no occupation is healthier than the farmer's. Considering then both the elements of strength, I am justified in the statement that your best hope for a strong people in the coming years lies in generously supporting this college, and in sending here as many as possible of your young men.

"The other element of greatness, individual or national, is wisdom. I speak in the broad sense in which real wisdom is incompatible with unrighteousness or any kind of dishonor. I will not go far astray if I treat agriculture as synonymous with country life, and group the other occupations of men in their present development as city life. History and observation speak with one voice on the influence of cities upon civilization. Sodom and Gomorrah and Babylon were cities of the ancient world; their names have come down to us as terms of reproach. Jesus, coming out of Nazareth, drove the money-changers from the temple in Jerusalem, and was crucified by the metropolis. When Rome became a metropolis she ceased to produce her own soldiers and scholars, and finally even her own emperors. The first modern state to be swallowed by her own metropolis is France; you know her condition and her prospect.

"The degeneration in the metropolis is intellectual as well as physical and moral. In spite of its formal educational advantages—and the country often pays for universities built in the city—and in spite of the tendency of the most capable to gather in the city and rear there their few children, the metropolis does not contribute its share to the brains of the nation. New York, Chicago, and Philadelphia are the greatest and wealthiest American cities. Each has one or more great universities. There is a constant movement into them of the ambitious and successful. Judging by heredity and by educational opportunity, they should more and more produce the foremost intellects of the land. We have statistics on the origin of the thousand foremost American scientists, one set made 1903 and another in 1910. These lists include all eminent professors of science, and the greatest physicians and engineers. In these seven years, the birth rate per million inhabitants, on the basis of one thousand scientists of eminence, has fallen:

In New York, from 71 to 33.
In Chicago, from 73 to 17.
In Philadelphia, from 49 to 23.

"Now what has this to do with us? Just this. It is in part in your power to keep the people of these Islands rural, personally independent, morally, mentally, physically and economically strong, and happy in the development and exercise of such

strength. You have served these ends in establishing this college. Personally, and as the government, you can make as you will the lives of your successors. If they are educated in agriculture, their interest will be in agriculture; and where their interest is the work of their lives will be. In making it feasible for any man to own his plot of land, large or small; in so regulating commerce that the farmer shall secure a proper profit from his toil; and in so distributing the advantages of organized society that the dweller in the country can practically secure a decent measure of comfort and be given a decent chance for intellectual development, you will serve the same ends for which this college was created.

"Or, it is largely in your power to magnify the city. You can fatten it at the expense of the country; cities always fatten so. You can take from Shanghai its proud and infamous epithet of the Paris of the East. You can make your city magnificent, and lead your people through splendor to inevitable corruption and decay. The surest way you can do this is by educating your youth away from the farm. The best blood of your people is going where it can get the best education. If you make that place the city, the most promising of the coming generation, the future hope of the Filipino people, will be educated into the city. I urge you, as you be men of clear vision and true to the abiding interest of your nation, that you follow no such false light.

"Rather give your young men into our care. Give us the resources to serve them as the vital need of a nation demands. And if you find us unequal to the task of making them good farmers, good citizens, and good men, do not delay replacing us with men better endowed with the Will that Can.

"So much for the function and hope of the college."

At this point, the speaker took up the history of the college, outlining its material development and present condition. As the history has already been given in these pages, and the crops on the farm will be described in coming papers more fully than was possible in the address, this part is here omitted, by the Dean's request.

"While we feel that we have so far done fairly in the development of the farm, we most emphatically do not regard the production of crops as our principal business. The college has a much higher function. It was established to train men as farmers, and we ask that we be judged by what we have done for our students.

"No student graduates from this college (and we have three ready to graduate this Spring) without a practical familiarity, gained by whatever amount of practice he individually needs, with every common agricultural tool and implement, and with the operations of all kinds necessary in the production of each Philippine crop. Altogether, this requires a really large amount of field work. I remember, Mr. Secretary, your fear expressed during our first, hard days, that we would be unable to hold our students. Of those who were with us then, only one is not here to-day; and the work did not drive him away.

"If you hear any man say that Filipino boys are less willing to work than are any other normal boys, believe me that he knows not whereof he speaks. And if he professes to know it from experience, put that down to his own discredit.

"Knowing how to work is a very different thing. The most of the boys, when they come, are decidedly inefficient. They have no idea what they can do, and their improvement is likely to be as much of a surprise to themselves as to anybody else.

"The practical work of the college then covers whatever a farmer may have to do. Our graduates will leave prepared to earn their living at once by work at which they have already become expert; or to manage such work, and manage it intelligently and effectively, as no man can do unless he knows by his own experience what he is managing.

"The instruction in the classroom covers everything of importance that is known about tropical crops. This field is so great that it takes four years of steady technical work to cover it. Before this our students must have two years of botany, and with it they receive two years of zoology and applied entomology, and two or more years of chemistry. The necessity of this more purely scientific work is doubted by enough men in positions where they should be able to judge wisely so that I will say a few words in explanation.

"The science was put into the course for practical reasons, and its presence is justifiable by these; but the explanation is somewhat technical. It serves another purpose whose importance will appeal to you. For illustration, if a man knows

how plants use water, he will understand when and how it should be given to them; he will probably use it and use it to better purpose and with better results than he could without such knowledge. This illustrates the practical value of our plant physiology. It will serve also as a type of the problems which confront and surround the farmer. But the ordinary and uneducated farmer has no appreciation of what his problems—aside from money—are, far less of how to meet them. The most of his problems do not even graze his intellect; and what a man knows nothing about does not interest him.

"The chief of the various reasons that men the world over are crowding into the cities from the country is that farm life is to them intolerably dull; the farm bores them,—because it does not keep their intellects alive. This is no fault of the farm; it has food and stimulant enough for the intellect of any man and every man. We require more botany and chemistry than does any other agricultural college under the American flag. With every day devoted to them the student gains in comprehension of the world of nature about him. With the widening of this horizon his interest grows. What we want to do is to turn out a crop of farmers so interested in the farmer's surroundings that life away from the farm would be intolerably dull. And for the most part we can do it. There would be no object in educating farmers, if they would not then be content to live on the farm."

Scarcely was the applause that followed the Dean's speech over when Speaker Osmeña was on his feet and delivered in Spanish his inciting speech.

We are sorry to be unable to reproduce it in this number, but we hope to publish it in our next.

Speaker Osmeña was followed in the use of the floor by a member of our Senior class, Mr. Clodoaldo Tenpongko, who spoke in our behalf. His speech embodies the real sentiments of every student toward our institution and the studies we are pursuing.

Speech of Mr. C. Tempongko.

Ladies and Gentlemen:

If we should measure the importance of events by the size of the crowd present, we will not be able to realize the true significance of to-day's celebration, the first of its kind in the Philippine Islands.

To the few that are assembled here, to the ninety-four fellow students who, against the prevailing ambition for other professions, have not deserted from the noble purpose you determined to achieve, to you I extend my sincerest congratulation, that through patience, hardships, and real enjoyment and devotion to the task, you have arrived at the opportunity of witnessing with joyful reverence the inauguration of these halls, the academic buildings of the first college of agriculture in the Philippines. More than this; with hopes for better prospects and with prospects of progressive advancement you inaugurate a new era for your country. Leaving behind you the home that you cherish, parting from the joys and pleasures of endeared companies of beloved beings, and carrying with you but tears, sweet memories and perhaps, a promise of faith, full of determination, you make your college home, not at the capital or in a city, not by entering a college of fine arts, literature, medicine or laws, but at a remote country corner to pursue a profession and take up work which is unfortunately thought by the greater part of our people to be an ignoble and inadequate task for a gentleman. But a clear conception of things has led you to a different ambition and idea of life. The same ignoble and inadequate task you now call the most noble and useful of professions; you open a furrow with pride and dig up knowledge from the great book of nature itself.

Such is the transformation in your minds that characterizes this epoch. May your examples be followed by the thousands of young men that crowd our colleges at the capital. Our country shall be more prosperous each day as her people take part in developing her natural resources, in promoting that which is the foundation of her industry and commerce. Her real welfare will begin only when she nourishes and clothes her people with the products of the native soil and can export a surplus to foreign lands. Then and only then shall we have overcome the lethargy condemning us and the coming generations to a dangerous future of complete despoilment. Should such a sad state of affairs arrive let us with humiliating defeat resign from the noble ideal we now pursue of becoming a free and happy nation. But a people that has begun to put forth a force of young men, armed with hoes and plows and a determination to face the burning sun, a force that has for its motto the "dignity

of labor," conferring upon this phrase a real significance and worth, that people may expect to overcome difficulties and succeed in the struggles for its ideal. Such a force will find its way, though it be difficult, and with jubilant heart we celebrate now the glorious advent of the fair hope of our country, the strong youth of to-day.

I finally voice the sentiment of the student body in expressing our gratitude and congratulation to the founders of this institution, to its benefactors, especially to those who devote their entire influence, effort, and time to promoting this most important branch of our University, the College of Agriculture. Its great significance appeals to them and demands their increasing interest and most effective cooperation and liberality so that the College may attain its most rapid advancement.

I thank you.

Secretary Gilbert was then introduced by the Dean. As Secretary of Public Instruction and chairman of the Board of Regents since the inception of the university, Mr. Gilbert is entitled to a large part of the credit for whatever the college is and does. In his address, which we regret not having for full publication, he met the students and guests as a friend, counsellor and trustee, touching with the full mastery which needs few words on the responsibilities and obligations of the college, the student and the citizen.

The Collection of Insects in Connection With the Study of Economic Entomology

By Felipe O. Cevallos.

The study of economic entomology is one of the most important and interesting studies in every agricultural college. It is a subject which deals with the study of both injurious and beneficial insects. Many insects are common around farms especially when a variety of crops are raised. They increase very rapidly if they have many different plants upon which to feed. Insects are injurious not only to field crops, but also to farm animals. Plants either give small yields or they die on account of the injury done by destructive insects. Some insects, however, indirectly increase the yield of farm crops by carrying pollen from one flower to another; others are valuable because they make silk, dyes, medicines, etc., out of the plants; and still others are helpful because they protect plants against the damage of other insects, as well as of other animals. For example, many fruit trees are subject to the attack of scale insects. These insects suck the juice of the plants, but they can be easily held in check by the presence of insects belonging to the family *Coccinellidae*, which feed upon scale insects. Thus the *Coccinellidae* are of especial importance to fruit growers.

A SHOWY BUTTERFLY
Hestia leuconoe Erich.

Collecting, Value of.—The collecting of insects is a very important part of the study or economic entomology. A student who collects insects not only uses them in the laboratory for the purpose of studying their different parts and peculiarities, but also for classification, for breeding, and for learning many things about them not to be found in the text-books generally used in the classroom. To be more specific, the student learns what insects are harmful and at what stages of their existence; what insects are beneficial and why; what plants or parts of plants are attacked and how; how insects vary with locality and altitude, etc.

Weather and time.—Before starting on a collecting trip, the first thing to observe is the weather. It is not advisable to go collecting when it is rainy or windy, because generally few insects will be caught. It is best to start on a collecting trip early in the morning, take a lunch along, and con-

tinue until evening. In this way a variety of insects can be caught.

Equipment.—It is necessary to have a complete equipment before going out to catch insects. It is not meant by this that the outfit need be expensive nor need it be extensive; many of the best articles can be home-made. The first requisite is a good collecting net. This may be made of any gauzy material but, perhaps, bobinette is preferable. Many collecters use a net with a very short handle but the writer, who was engaged in professional collecting for a time, found that a net with a handle rather more than two meters in length was the best for all-around work in the Philippines. The next essential is a killing bottle unless chloroform or ether is carried. A killing bottle may be made by placing cyanide of potassium in the bottom of a wide mouth bottle and covering it with wet plaster of Paris which becomes hard holding the cyanide in place but allowing the fumes to escape into the bottle. The greatest care should be used in the preparation of the bottle as well as in the use of it in order that no one may become poisoned. Some collecters carry a vial of ether or chloroform and apply the liquid to the abdomen of the insect while it is yet in the net. It is well if possible to take along a small box and rectangular papers of various sizes in which to place the lepidoptera after killing them, for they are apt to become injured if left in the killing bottle. One or two bottles partly filled with alcohol are necessary for soft bodied insects. For diptera pill boxes and tissue paper are useful. Pill boxes and empty bottles may be carried if it is desired to collect insects for breeding or rearing.

Where to look for insects.—Some insects are found in the open fields, others along hedge rows; the rivers, lakes, and their borders shelter other forms. Kayingins with decaying trees are fruitful, while the dense forests are often quite disappointing.

It is necessary to look on the under side of leaves, under the bark of trees, under logs, on stones in the river and all other places where insects may find shelter. The writer believes in taking almost everything he finds in the field and sorting in the laboratory.

Behavior of insects.—Almost all insects have some means of escaping from their enemies. Some insects have the habit of falling to the ground and disappearing suddenly from sight; some fly very swiftly because they have light bodies and strong wing; others bite or sting while many exude a disagreeable fluid which deters the capturer. Insects like other animals have various methods of adapting themselves to their surroundings and protecting themselves thereby. The insects which belong to the family Phasmidae are remarkable for their resemblance to sticks or green leaves. Some moths and butterflies resemble leaves.

At the College of Agriculture the collecting of insects and the study of their environment and behavior is greatly encouraged. During the last long vacation ten to fifteen students were hired to do regular collecting and many thousands of specimens were taken. At the same time twenty-four former students of the College who were at

COMMON HEMIPTERA

Tesseratoma longicornis Dohrn. Belostoma indicum Lep. et Serv. Platypleura fulvigera Walk.

their homes in different parts of the Islands were collecting and mailing insects to the Institution. Determined insects are being sent to experiment stations in the United States and foreign countries while those new to the collection are being sent to specialists in different parts of the world for identification or determination. By receiving insects from nearby tropical countries we shall be able to anticipate injurious forms which may be dormant in the Islands. The same species from different localities will give a basis for working along the line of variation.

On account of the range of altitude on the College farm, the presence of a river running through it and the proximity to a lake and mountain the opportunities for collecting in the vicinity of the College are excellent.

Some Local Insects of Economic Importance

ANDRES F. NAVARRO.

The farmer who expects to get profitable returns from money invested must know how to overcome the ravaging effects of insect pests. The problem of the control of the enemies of plants becomes more and more complicated, instead of simplified, as the farming industry of his region is developed. As more crops are raised insects find ample supplies of food, which favor rapid multiplication.

Because of the great financial loss which may occur through the attack of insects pests, the planters should try to check their increase as soon as possible and direct aff efforts to reducing the injury to the minimum. If a farmer fails to discharge the requirements in this phase of his business, he is doing great injury to himself and to his neighbors. The spread of two

GIANT BEETLES
Xylotropes gedeon Linn. Lucanus sp. Oryctes rhinoceros Linn

very injurious insects in America affords us sufficient proof of the results of neglect in this matter. I refer to the Colorado beetle which attacks the potato and the boll weevil which attacks the cotton. If the campaign against these insects had begun as soon as they appeared they would not now be causing such enormous losses to the farmers each year.

In the Philippines several insect pests are reported as injurious which are yet controllable and should, therefore, receive special attention, for when they have once gained a firm foothold they will be difficult to eradicate. The first step in the eradication of the above is to rid ourselves of the belief of our ancestors, that a failure of crops, due to insect pests is brought about by Providence as a punishment for sins, the next is constant vigilance, and a third, ceasless effort guided by correct methods.

A number of insects which might do considerable damage have been anticipated on the college farm. Their life-histories have been worked out by the class in economic entomology and experiments are being conducted to determine the best methods of exterminating these pests. Results are to be published from time to time for the benefit of those who are engaged in farming. The results of spraying experiments are to be given in the next number of the College publication.

The following are a few of the local insects of economic importance whose life-histories have been worked out by the members of our class:

CORN MOTH BORER.

(*Pyrausta vastatrix Schultze.*)

During the months of September, October and November this pest did its most destructive work. Two corn fields on the college farm were severely attacked, so that the yield was greatly decreased. A near-by farm was similarly attacked and the field was rendered almost worthless. An infested field cannot fail to attract the attention of even a casual observer. The injury is caused by the larva of a pyralid moth (*Pyrausta vastatrix Schultze*). The insect is nocturnal in its habits. The eggs are laid at the axis of the leaf or on the tip of the ear. When the larva hatches it begins to make tunnels through the soft part of the stem and those that are on the ear begin to eat the soft grains and the cob. Because of the tunnels the stems become so feeble that even a gentle breeze causes them to bend or break. The material excavated is in the form of a yellow powder. When the ear is attacked a kind of putrefaction starts which produces a characteristic odor.

The larva is white and is covered with short black bristles. It is ten to fifteen millimeters long and about two millimeters in diameter. Within a week the active larva enters the dormant stage, the pupa.

The pupa is brown, not more than ten millimeters in length and two millimeters in diameter. It is generally found near the entrance of the tunnel to facilitate the exit of the adult when it emerges.

After five days the imago emerges from the cocoon. The adult is a white moth not more than two centimeters wide and about one centimeter long. The eyes are red, a prominent characteristic of night flying lepidoptera. The moth is not a swift flier and its movements are undulating.

It has been observed on the College farm that the pest is sporadic and only occurs when the conditions are favorable. At the present time the pest is held in check by its natural enemy, a tachinid fly. This dipteron parasitizes the larva by ovipositing on its body. When the maggot hatches it subsists upon the larva and thus destroys it.

Because the larvae work internally and because of the liability of poisoning people and animals eating the corn, stomach or arsenic poisons are of no avail and may do much harm. So the farmer who is confronted with this problem must encourage, if possible, the multiplication of the Tachina fly or must plant the corn so that it will mature when these pests are not prevalent. In the vicinity of Los Baños the best time for planting corn is from November to January.

ATTACUS CAESAR MAAS

The Banana Leaf Roller.

(*Erionota thrax Linn.*)

The banana leaf roller belongs to the lowest family of butterflies, the *Hesperiidae*. All varieties of the banana (*Musa sapientum*) are hosts of this pest. While the local injury at present is inappreciable it may in time prove to be one of the greatest menaces to the banana grower.

The larva cuts the lamina of the leaf with its powerful mandibles. The rolled portion is held together by a silken thread secreted by the worm. This process of leaf rolling is one of the most interesting ones to be observed in nature. The rolled leaves are used both for food and for shelter. After the inner part of one roll is dry, the larva moves to other parts and makes another. The process is repeated over and over again until it makes the last roll, in which it spends the hibernating stage. In one case under observation in the laboratory the hibernating stage was passed in a piece of paper used in lieu of a leaf.

The grown larva is about five centimeters long and less than one centimeter in diameter. The head is black and the mandibles are very powerful. The color of the larva is green but it generally appears to be white which is probably due to an accumulation of waxy bloom received from the surface of the leaf. After a few days the larva enters the pupal stage. The pupa is about four centimeters long and one centimeter in diameter. Its color is ashy. After eleven days the imago appears. The moth is about three centimeters wide and two centimeters long. The color is brown with three yellowish transparent spots on each forewing. The eyes are very prominent and red. This moth is observed to dart about among the papaya flowers at dusk together with another moth which will be described later. Thus as special agents in the fertilization of the papaya they do great good. Outside of this work they are considered harmful.

The Ilang-ilang Moth.

(*Attacus atlas, var. lorquinii Felder.*)

The ilang-ilang moth is the great drawback to the Philippine ilang-ilang industry. This moth belongs to the family *Saturniidae*. Its injury is not confined to the ilang-ilang (*Cananga odorata*), but it also attacks the ates (*Anona squamosa*) and the guava (*Psidium guayava*). The larvae are so greedy that a tree is often defoliated before the pupal stage is reached.

The eggs are reddish in color and about thirty to forty in number. The larva is greenish white and about one decimeter long and more than a centimeter in diameter. On its back are spines for defensive protection; they give the larva quite a formidable appearance. The pupa is reddish brown and is enclosed in a case of tough silk. The larva uses a leaf to form a part of the case. The pupal stage lasts about one month. The month is twenty by ten centimeters in size. The color of this beautiful moth is too well known to require extended description. A prominent characteristic is the three large triangular "windows" on each forewing. The males

are smaller than the females and the angles of the "windows" are more acute. The antennae are large, plumose and handsome. Filipinos try to rid trees of the pests by picking the larvae and destroying them. Spraying with arsenic poisons is effective against these insects.

The Gabi Moth.

(*Chaerocampa celerio Semper.*)

Along the banks of the creek which passes through the College campus grows a variety of wild gabi (*Colocasia antiquorum*). During the early part of the school year it was found to be defoliated. Cultivated patches of gabi on the College farm and in the vicinity were found to be similarly attacked. The destructive work of the insect attracted the attention of the class and we set out to find the insect which caused it. Upon examination a green larva was found gorged with leaves. Its life history was worked out and the insect bred was found to be a moth belonging to the family Sphingidae.

The eggs are laid on the under surface of a young leaf. When the grub hatches it begins to consume the leaf. After this is eaten it goes to the next lower and so on to the lowest and oldest one. One of the larvae observed in the laboratory ate two square centimeters of leaf in one minute. The larvae are bluish green at first but become darker as they mature and finally become quite brown. On the dorsal part near the head is a darker green "eye," containing four yellow spots, which gives the insect a fierce appearance. The posterior end is armed with a caudal horn which farther heightens its terrifying apperance. This horn is a family characteristic of the sphingids. The mature larva measures about four centimeters in length and one centimeter in diameter. After fifteen days the grub enters its dormant stage and eleven days thereafter the moth appears. The pupa is reddish brown, about four centimeters long and one centimeter in diameter. The adult is about three by two centimeters. The body is pointed at the posterior end of the abdomen and covered with rather long hairs. The color is ashy to brown. The eyes are red and the proboscis is extremely long. The usefulness of the adult in the pollination of papaya has been already referred to above.

These pests can be successfully combatted with the aid of arsenic poisons.

Nymphalid.

(*Anosia chrysippus Linn.*)

This insect was found on a plant belonging to the family Rubiaceae. The plant was twice defoliated but because of its hardiness it was able to recover from the attacks.

The larva is about five centimeters long and about one centimeter in diameter. It has alternate bands of black and blue with occasional yellow and red markings. Spines cover the body. Its pupa is shorter and thicker than the larva. The larval stage is fourteen days and the pupal stage seven days. The ground color of the adult is light brown with dark brown and white markings.

Arsenical sprays are effective against this insect.

The Red Cotton Bug.

(*Dysdercus cingulatus Fabr.*)

The second crop of okra grown on the College farm was found to be infested with an hemipterous insect much like the red cotton strainer of the United States. As these bugs occurred in great numbers several males and females were collected and work on their life-history begun.

About seventy-five eggs were laid by one female. They were placed in the ground and covered lightly with earth. In eleven days the eggs hatched into minute red bugs with black antennae and legs. (Under more favorable conditions other eggs hatched in six days). After three days the young bugs moulted and again in four days. Five moults in all occurred and fourteen days were required to complete the growth of an insect. The adults are striking in color being red in general with black antennae, wing tips, and with one black spot on each wing as well as one on the scutellum.

This insect attacks the cotton tree and the okra (*Hibiscus esculentus*), and, perhaps other plants. It attacks not only the leaves of the okra but the seeds as well.

While these insects were held somewhat in check on the College farm by a species of tachinid fly, hand picking was found to be a very efficacious way of getting rid of them.

The Rice Army Worm.

(*Spodoptera mauritia Boisd.*)

At different times there have appeared in different parts of the Philippines caterpillars which destroyed entire fields of rice and

then disappeared. While there are in the tropics several of these army worms, the one most commonly met with is the smooth striped larva (*Spodoptera mauritia Boisd*).

An outbreak occurred in the vicinity of Tanauan, Batangas, in May, 1910 and material was obtained from which the life-history of this pest was worked out.

The eggs of this army worm are laid on the bases of plants or even on sticks or stones. According to climate conditions the eggs hatch in from five to eight days. The larvae were on an average thirty milimeters in length. The general color of the dorsal region was dark grey and of the ventral region light grey. The dorsal side bore ten short transverse stripes. The sides of the larvae were traced with yellow. The larval stage lasted six days. Copulation took place under the ground or among the debris in the bottom of the breeding cage. The pupal stage was five days in length.

The outbreak in Tanauan was checked by the parasitizing of a tachinid fly and by climatic conditions which disturbed the balance of nature and threw conditions against the moths. Trenching or the use of the hopper bag is effective against these insects.

A Pierid.

(*Catopsilia pyranthe Linn.*)

The larva of this butterfly was found on the leaf of a vine called in Tagalog, Kalitkalít (*Vitis carnosa*). This plant belongs to the family *Ampelidaceae* and is related to the grape and woodbine of the United States. The larva is four centimeters long and eight millimeters in diameter. Its ground color is green, dotted with minute black spots, and it has a black and a yellow stripe on each side. The larval stage lasts seven days. The pupa is green in color and attaches itself to a twig by means of a slender thread, a characteristic of the pierids. Eight days is the length of the pupal stage. The imago is yellowish to green with coffee colored markings near the tip of the forewing and sometimes an edge of the same on the hindwing.

The possibilities of this insect increasing and doing harm to crops of economic value should mark it for early destruction if it appears in any numbers. Spraying with stomach poisons will eradicate this butterfly.

An Aganaid.

(*Asota philippina Rothschild.*)

A species of the genus *Ficus* was found to be defoliated by the larvae of this moth. The larva is four centimeters in length and five millimeters in diameter. Twelve distinct segments are visible in the larva. This ground color is dark brown with black markings and yellowish stripes. It is slightly pubescent. It takes twelve days for this insect to pupate. The pupa is brown, has a prominent shield, and shows nine distinct segments. After fourteen days the imago appears. The latter has a yellow body with black spots on each side; forewings brown with white stripe near the center and several black spots near the base; hindwings white, bordered with brown.

Arsenic remedies may be applied with success in combatting this enemy.

Other life-histories have been worked out which will be published as soon as the insects reared are identified. It has been thought best to place information regarding the habits of the more common forms in the hands of our readers at once. It should be noted that very extensive work is being done on the life-history of both beetles which attack the coconut. Such accurate information as is sought by the College seems not to be available at present and the greatest differences are given by different authorities regarding the length of time of the larval stage and the pupal stage of these insects. Before the close of the school year 1911-12 it is hoped to have something definite to offer regarding conditions which surround the growth of these pests.

In closing this article reference should be made to sericiculture, an industry which is just beginning at the College and which will form a part of the work of each student in future classes in economic entomology. A silk house has been erected and a thousand mulberry trees are in healthy condition and ready to furnish food. As soon as arrangements can be made bee-keeping will also be made a part of the course.

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Organ of the Student Body of the Philippine College of Agriculture Published Monthly During the School-year

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THE CARNIVAL AND AGRICULTURE

It is the support of the Government, given in money and in various other ways, which has made the Carnival possible. The important thing about the Carnival, from the standpoint of the Government, is its exposition feature; the immediate impetus to business and the week of gayety are desirable, but secondary features. The products of agriculture have of course been conspicuous in the Carnival exhibits, but they have not been a dominant feature in at all the measure in which agriculture dominates the business of the Philippines. Neither have they represented the agricultural resources and powers of the Islands, as distinguished from fairly common agricultural achievement, as, for instance, the forestry and live stock exhibits have done.

This condition is easy to understand, and the remedy is easy to see, even though up to this time it has been impossible to apply it. The trouble is simply that there are no exhibits by the planters themselves, and that accordingly nothing is grown for the purpose of exhibition. In order to have any exposition at all from outside Manila, the Carnival Association has had to invite the provincial governments to participate, and leave it largely to the latter what they would bring. The limited number of provincial governments having enough money and enough interest have collected what products they could, almost entirely by purchase, and in a hurry. At the best they have exhibited the best that happened to be available. Prizes have been given to provinces making especially fine exhibits; but these prizes have not resulted in better products, for exhibition or for any other use.

The plan of relying on the provincial governments for the exhibits, however necessary it may have been or may be, will never produce a worthy agricultural exhibit. It results in too hasty preparation, participation by too few people, and these not usually planters nor personally interested in the individual exhibits. And if a province does not exhibit, its farmers are practically excluded. A still more serious defect is that by failing to interest the individual hacenderos it misses a chance to raise the standard of local agricultural production.

The remedy is obvious: Get the men who raise the crops to make the exhibits. Instead of a few large prizes, offer a large number of small premiums for best single products. Make space free to individuals; each will want very little. Make the cost of exhibiting as low as possible, as is done now by free transportation. The exposition is a permanent institution; make this known throughout the Islands, and there will be an inducement to farmers to grow products for exhibition. Mr. Cruz of Pampanga makes no attempt to produce a bigger cane than he ever did before, for an exhibit in which he has no personal interest and which his province may conclude not to make. But he will try and will grow bigger and better cane when he knows that by making a better exhibit than Mr. Santos of Negros he can get a premium honoring him as the best sugar grower in the Philippines. Then we will have decidedly better exhibitions. And, what is much more important, the exposition will have a big influence in improving the farm products of the Philippine people.

The present plan is what an American State Fair would be if the exhibits were made by the counties, instead of by the people. Intervention by the provinces will be useful here, and necessary for a time; and diplomas or cups should still be offered to the provinces making the best collective displays. But the premiums should be to individuals, and the personal interest of the farmers should be aroused as rapidly as possible. We want a vigorous propaganda, reaching every farmer in the islands who can grow or prepare any really first-class farm product.

HOG RAISING IN THE PHILIPPINES

Hog raising in this country is an almost certain source of profit to those who undertake intelligently this branch of Agriculture. The conditions in the Philippines are in some respects more favorable for this enterprise than in most other countries. The hog raiser here is not obliged to protect his animals against the winter weather of temperate climates; feed and green pasture are abundant the year around; the market is here in the islands, and the local product can always be sold at a good price; the temperature is never such as to make losses in transportation heavy. As is the case in the hog raising districts of other countries, this farm industry has here many advantages over others. The work required to care for swine is done at odd times and the owner may spend the greater part of his time looking after other farm work.

The native hog, as a rule, possesses about the same characteristics as his ancestor, the wild boar of the mountains. Most domesticated hogs are narrow and long with the characteristic long snout and legs and the sway back. Under the most favorable conditions, they would doubtless fatten slowly and give some returns, but the exact opposite of favorable conditions is the rule rather than the exception. Hogs are usually made the scavengers around the houses, and are fed on cooked chopped banana stalks and wild roots on which no hog can thrive. Such condition exists almost anywhere in the Philippines. In this province hogs are fattened and sold on the market with good profit. The natives of Jala-Jala claim to have the best hogs in the islands and specimens sold in the Calamba market seem to prove that their claim is not without foundation. There is a white variety of hogs in the north part of Batangas. This hog has better fattening qualities than the average type.

A visit to the Alabang stock farm, on different occasions, has convinced many of the students of the College that the best way to improve native swine is to cross him with the Berkshire. Native-Berkshire crosses were, in some cases, hard to distinguish from the pure-bred stock. They were broader, shorter and more refined than the native hogs. Native farmers around Alabang were quick to note this improvement and are bringing their sows to Alabang to breed.

We have learned that, in order to succeed in hog raising, we must have plenty of good feed for breeding stock. In fact a greater variety of hog feed is available in the islands than is ordinarily thought. Corn can be bought anywhere. In this province it is worth two pesos a bushel, or less. *Poñgapong*, *ubi*, *gabi*, and sweet potatoes, are available as pasture and for feeding. They serve the same purpose as root and pasture crops in the hog raising districts. Coconut meal the digestible feeding value of which is known to be excellent can be obtained in localities where cocoanut is grown. *Mongo*, peanut, and cow-peas will furnish good nitrogenous pasture crops for breeding stock. Such feeding should sufficiently nourish the mother to stimulate the growth of the litter and prevent them from getting stunted while young. They can be weaned at about three months and fattened on pasture and be ready for the market when ten to twelve months old.

Perhaps the greatest drawback in the islands to this industry is hog-cholera, an infectious disease caused by a germ. Certain writers say this disease acts about the same with swine as typhoid fever does in man. The disease is said by the Agricultural Review to exist in nearly all parts of the islands. According to this paper, the best way to combat the spread of the disease is to keep hogs away from contaminated streams and to separate the sound ones from those that have contracted the disease.

A. F. N.

The Establishment of a Vegetable Garden

By TORIBIO N. VIBAR.

THE SELECTION OF THE LAND.

The first problem that will confront a person desiring to have a vegetable garden is the selection of good land. The land is one of the most important factors, upon which the success of the gardener depends. The profit of the gardener varies with the grade of the land, which, therefore, must be thoroughly examined before establishing the garden. There are many factors which influence the character of the land. Some of these are the shape, the contour, the character of the soil, physical and chemical, the moisture, facilities for irrigation and drainage, the climatic condition, the surroundings, etc. The beauty of the surrounding is not an essential factor. That the location is beautiful is not a guarantee that the land will produce good crops.

Chemical analysis of the soil can not be entirely relied upon to determine its fertility. A soil may be rich in plant food, yet the crops growing on it may be inferior to those growing on a soil less rich in plant food. A good soil is one in which the plant food present is in available form, and in proper proportion. The fertility of the soil may be determined by the growth of the vegetation on it. If the land is unplanted, its fertility may be known by testing the soil in pots, in which plants may be allowed to grow, or by growing crops on it on a small scale. Vigorous growth of vegetation on the land is a sign of the fertility of that land. It has been found by experiment that plants of the same or related species take food in nearly the same proportion. It is almost sure that in a soil in which turnips grows successfully cabbage will grow well also.

The land desirable for a garden should be slightly sloping. In such land there is a constant movement of ground water carrying fresh plant food to the roots. The supply of plant food in the soil, therefore, is not exhausted so readily as it can be in flat ground. The land should be near running water or a well. The garden needs water to irrigate, especially in the dry season. He needs it also for many other purposes. The land must be drainable. Too much water in the soil is injurious to the growth of plants as will be seen hereafter. The soil should be a rich, deep, friable, sandy loam.

A soil that needs comparatively little preparation is desirable for a garden. If the soil will require too much expense to bring it into suitable condition, it would be better to look for another location. Experience is an essential factor in selecting land, consequently if the purchaser has not had previous experience, he would do well to consult a practical farmer or a student having a knowledge of the subject.

LOCATION OF THE GARDEN.

If the gardening is to be carried on on a large scale, it should be located where the products can be marketed readily; that is, near a large town or where means of transportation are available. In this case, the expenses in transporting the products will be comparatively little. The vegetables may be put on the market quickly and in a fresh condition. If the garden is intended only for the use of the family, it should be near or adjacent to the house. The garden needs care from the time the plants are planted to harvesting time. If it should be neglected for some time, everything will be sure to go wrong: the soil will be hard, the weeds will grow, the insects and other enemies will bother the crops more or they will be destroyed by wandering animals, etc. For these reasons, it is most desirable that the garden should be located where it may be under constant supervision. To avoid exhaustion of the soil, it is advisable to change the location of the garden from time to time unless manures are used.

LAYING OUT THE GARDEN.

Having the land selected and the garden located, the gardener will now turn his attention to the laying out of the garden. There are many points to be considered in doing this. Foremost among them is the size of the garden. The size is dependent on the demand of the people for vegetables, and on the amount of labor, which can be given to it. It is useless to lay out a big garden if the product is more than is needed, and if the garden can not be well managed and cared for. For a beginner it is advisable to start a small garden, which he may gradually enlarge as his experience broadens.

A careful plan should be made before beginning the operation. A garden well layed out will ensure economy of space, time, and labor. Straight rows are desirable; they must be so spaced as to allow as much cultivation by animal power as possible so as to minimize hand labor. If the garden is to be carried on for years, the maintenance of the soil fertility becomes an important factor in planning the garden. The fertility of the soil can be maintained by proper rotation of crops, the facility of which is dependent on the way the garden has been planned.

It is desirable to have a variety of crops in the garden and to grow those crops which are most valuable. The garden must be properly divided among them. Disregarding the shape, let us suppose that a garden has an area of 5,000 square meters. The division of this area among the different crops depends, of course, on the local condition. The following is suggested:

Camote	1,000	sq.	m.
Maize	1,000	sq.	m.
Camoteng cahoy	500	sq.	m.
Legumes	500	sq.	m.
Tomatoes	200	sq.	m.
Cabbage	150	sq.	m.
Egg plants	150	sq.	m.
Lettuce and Radish	50	sq.	m.
Red Pepper	50	sq.	m.
Squashes	50	sq.	m.
For seed and other crops, etc.	1,350	sq.	m.
Total	5,000	sq.	m.

PREPARATION OF THE SOIL.

After planning the garden the next problem is the preparation of the soil. The tools to be used must first be taken into consideration. The use of appropriate tools will be found to save time, energy, and expenses. It is is a bad policy to use spade or spading fork to prepare a large area, and it is also not correct to plow a small garden where it is difficult for the plow and the animal to turn around.

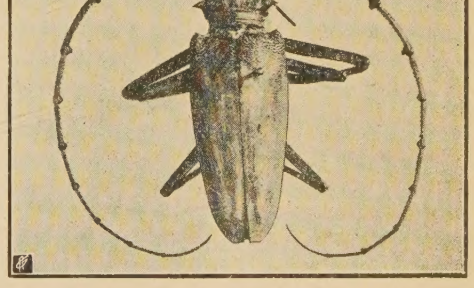
The first step to be taken in preparing the soil is to clear the land and to root out all stumps. If the grass and the stumps can not be burned right on the garden, they should be so disposed of as not to interfere with the future operations and provide a breeding place for insects and other pests.

If the garden is big, a plow must be used. The soil may be made fine and uniform after plowing, by the harrow. If it is small, spade or spading fork would be found most serviceable. The spading fork is more applicable if the land is not rooty and rather hard; but if the land is rooty and friable a spade is needed. The spade will cut the roots, thus making it easier for the hoe to break the lumps of soil and for the rake to make the soil uniform.

The condition of the soil and the climate before, during, and after preparing and thel are things which should be considered. A soil too wet after heavy rain, or too dry and hard after hot weather, is not so easily prepared as a soil just moist enough to crumble.

"A soil thoroughly and deeply prepared will be comparatively free from weeds, root penetration will be encouraged, and the plant food in the soil will be made more available, thus stimulating the plants to rapid growth."—Mr. Harold Cuzner's The Garden.

The thorough preparation of the soil is the basis of success. It should be born in mind that the purpose of the preparation of the soil is to furnish the roots of the plants and the microorganisms in the soil with a comfortable home, where they can easily grow and perform their proper functions.



AN ENEMY OF TIMBER
Batocera numitor Newin.

CURRENT LITERATURE

MEXICAN AGRICULTURE.

Publication on Mexican agriculture during the last few years has been in very large part due directly or in directly to the activity of Dr. Pehr Olsson-Seffer. In 1905, he succeeded in interesting Americans, with capital invested in Mexican rubber, in the establishment of the Zacualpa Botanical Station and Rubber Laboratory. This station existed for three years; as an institution it published nothing except one paper on rice, but its staff did a considerable amount of good work. When it was abandoned, Olsson-Seffer tried to get support for a rubber laboratory from the Mexican government; and when this proved impossible, opened privately a laboratory and botanical station at Tacubaya, near the City of Mexico. Beginning with January, 1910, he has edited and published the American Review of Tropical Agriculture, for which a large part of the material is furnished by the staff of the Tezonapa station.

While the station is in a suburb of the capital, it is called the Tezonapa station because its field work and practical experiments are carried on at Tezonapa, in the state of Vera Cruz. The station has a small garden, and a good building, which house an office, a morphological laboratory, a laboratory for plant physiology, one for chemistry, a photographic outfit, and a museum.

RUBBER.

A very large part of the activity of these stations has been devoted to *Castilla elastica* (the name is more often spelled *Castilloa*), commonly known as Mexican rubber, although the larger part of the Mexican rubber export is derived from guayule. During the past four years, the director has himself made no less than thirty publications on this subject.

The first discovery of rubber by Europeans was in Mexico, and it was already one of the useful plants of the Indians. Mexico was also the first land to undertake the cultivation of rubber as a plantation product. The first plantations were started by Chacón and Romero, forty years or more ago, at the extreme southern point of the republic, on the Pacific coast of the Tehuantepec isthmus. This is still regarded as the best district for this culture. Some of the earliest plantations proved exceedingly profitable.

It was not the native planter's practice to advertise to the world his new source of income; and it was not until considerably later that the possibilities of rubber were brought to the attention of American promoters. In the boom that followed forty to sixty million dollars Mexican was supposed to be invested in rubber plantations, and about 130,000 acres to have been planted, of which probably 85,000 acres are gradually coming into bearing. Some of the companies were legitimately managed, in the office and in the field, and are beginning to reap the returns. But many of them put more energy and intelligence into promotion than into agriculture, and in due time become bankrupt. Mexico now looks for the greatest future success of this industry from the advent of more conservative European capital. From what we have seen of rubber companies in the Orient and from the recent English rubber bubble, this hope does not seem to be devoid of a humorous side.

Regarding the soil requirements, Olsson-Seffer says:

"*Castilla* needs an open porous soil, well drained, but with sufficient underground water supply. The chemical consistency of the soil or its relative richness is of little importance. Stagnant water or very acid soil is detrimental, and thin soil with hard, impermeable subsoil will grow *Castilla* for a few years, but when the tree reaches six or seven years of age, and the roots penetrate deeper and reach water, growth ceases and the tree is liable to die back."

"..The distinct and comparatively long dry season of the Pacific coast is a decided advantage for the rubber culture. I will explain this by briefly giving my views regarding the function of the latex in *Castilla*.... There can be no doubt that the latex at certain times forms a protection for the plant, not only by preventing insects from attacking the vital parts, but also by covering any wound accidentally made. It is also proved that the latex contains a large amount of stored-up food. Whether and to what extent the rubber tree can draw upon this store is as yet unknown. One of the primary functions,

however, of latex is that of preventing a too rapid transpiration. For this reason we find that the rubber trees growing a region with a distinct dry season develop a larger amount of latex as a provision against the drought of that period."

With regard to shade, there are three methods in use: planting in heavy shade by leaving the large forest trees; planting in light shade, by leaving three or four large trees to the acre (say ten to the hectare); and planting in the open after clearing the land clean, or where the land is already in cultivation. The first cannot be recommended. Which of the others is preferable depends on the local humidity, in air and soil. However, the best situation must be one in which grown trees demand no shade and there is no excessively wet season.

"The method of planting first employed in Mexico.... was to sow the seeds in nurseries, and when the seedlings were four to six months old they were transplanted. Very often, however, transplanting was not done before a year after sowing. The plants were than from five to twelve feet high. The seedlings were cut five or six inches below the surface, and topped, leaving a pole some three feet long. Tied into bundles, these poles were carried into the field. With a pointed stake, holes were made in the ground about one foot deep, and the pole placed in the hole and the soil pressed close to the stem. When this planting was done carefully and if rain fell within the next two or three days not more than three or four per cent. of failures occurred. In places where the soil was somewhat sandy the failures were more frequent.

"On La Zacualpa as many as 18,000 trees have been planted per day in this manner...

"Later experience has proved that the cheapest and surest method is to plant the seeds at stake. Nearly a year's growth is thus gained, and it does away with the expensive replanting, where failures occur under the transplanting method. The seeds are planted in small hills, about seven seeds in each hill, three inches between the seeds. The hills are at a distance of about seven feet, in rows twelve feet apart."

This method of course provides a great excess of seedlings, and this permits a thorough elimination of all but the strongest. Half of them are removed the first year, and others from time to time during succeeding years. At the end of the sixth year, there are left approximately two thousand trees to the hectare. Half of these, still selecting the inferior ones, are then tapped to death, leaving the other thousand for the permanent plantation.

"Cultivated *Castilla* trees should not be tapped before they have reached a circumference of 24 inches at 3 feet from the ground. Nothing is gained, however, by postponing the tapping after this time. On the contrary, tapping will cause a more rapid growth in girth." Trees are sometimes tappable at an age of six years; but as a more general rule not until they are eight years old. "The question is often raised what length of life has a rubber tree. So far the oldest plantations are under thirty years, but to judge from the appearance of these I do not think the planter should count on a longer life of his plantation than 30 years from the time the trees come into bearing and he should make his plans for rotation accordingly."

"In regard to tapping *Castilla* trees I have advised the employment of the 'half-herringbone' system in the following manner: A rather shallow vertical channel is first opened from the height, to which it is intended to tap the tree. At the bottom of this vertical incision the collecting cup is attached to the trunk... The operator now makes an incision on the left side of the vertical channel, at an angle of 45° to this, and as close to the base of the trunk as possible. This incision should reach nearly to the opposite side of the trunk. The plan is to leave approximately 2 inches of bark surface uncut between the end of the incision and the second vertical channel, which will be opened opposite to the first one at the next tapping of the tree. When this second tapping is done, the oblique cuts are commenced at the same distance, or at about 2 inches, from the first vertical channel. This leaves on each side of the tree a narrow strip, 2 inches wide, from the base to the top, where the cortex has never been injured and the development of the tree can go on at all times without interruption."

The rubber of *Castilla*, when properly prepared, is not distinguishable from that of *Hevea* (Pará). Plantation Pará has a higher market rating, because it is usually put on the market in better condition. From personal observation in all countries where rubber is cultivated, Olsson-Seffer is perhaps the best qualified man in the world to judge the advantages and dis-

advantages of the different kinds. He is also president or director of a number of rubber companies, not one of which plants Pará. The reason lies in the cost of collection. *Castilla* yields much more latex at each tapping than does *Hevea*, and is accordingly much cheaper to collect. Labor is more expensive in Mexico than in any countries where Pará is cultivated, and it is believed that this condition would make the cultivation of Pará less profitable than that of *Castilla*. LABOR IN THE PHILIPPINES IS HARDLY CHEAPER THAN IN MEXICO.

There are several Mexican plants which produce rubber, but as already noted only *Castilla* and the guayule plant yield it in any quantity. The latter has not been proven susceptible of plantation culture. It is a composite shrub, *Parthenium argentatum*, growing in very dry country.

H. Juan Ludewig has an interesting article on the rubber culture of Mexico in Der Tropenpflanzer of October, 1910. Basing his conclusions on the ports from which the rubber is exported, he classifies the rubber export for the fiscal year 1908-09 as:

Guayule 5,601,658 kg. worth 7,653,659 dollars Mex. and Castilloa 413,315 kg. worth 1,065,767 dollars Mex.

Of the *Castilloa*, he regards 40% at the most as plantation rubber, the rest being a forest product. He believes that where a Castilloa plantation is well managed it will be only reasonably profitable; and has no doubt that many of the plantations would have done better if they had engaged in the cultivation of cacao, maize, bananas or cane, or even is stock-raising. Small Mexican plantations of Pará and Ceará rubber are reported.

DESTRUCTION OF AGRICULTURAL LAND.

Runar I. Olsson-Seffer has a short note in the Am. Rev. Trop. Agr. I: 162, condemning the pernicious practice of clearing forest land for temporary agricultural use, and then permitting it to go to waste. The condition he dscribes is the same in causes and results that we are familiar with in the Philippines, except that Mexico seems to be spared the consequent plagues of locusts. And the caiñgin system is bad enough without these.

NEMATOD WORMS.

In the same journal, page 99, Prof. C. F. Baker describes a serious disease caused by these minute worms, of the genus *Heterodera*. They penetrate the roots of various plants, and breed therein, causing the death of the hosts. Among especially susceptible plants, Baker mentions tomato, cabbage, radish, turnip, tobacco and cotton. With regard to remedies, it has not been found possible to kill the worms in the soil by any methods economically practicable. The recourse suggested is to the cultivation of resistant crops, those mentioned being cow-peas and beans, and millet or other forage plants. "The system to be recommended then, for several succeeding years is as follows:

"1. On infested ground plant only the least susceptible crops like the legumens and forages, alternating these from season to season, and avoiding all root crops and tender vegetables or cotton or tobacco.

"2. Keep all weeds carefully cleaned out.

"3. After the harvesting of each crop, pull out all remaining roots, pile them in heaps, *and burn them.*

"4. Use only stable manure or commercial fertilizers to enrich the land.

"Every third or fourth year after this system is in perfect working order, a year may then be given to the tender garden vegetables, and it has been found that under such circumstances they may be raised with a fair show of the best success."

The destruction caused by these pests has long been known in Europe, in the southern United States, on coffee in southern Brazil, and on various crops in Java; but the author seems to have overlooked the excellent work of the Dutch in the last country. In many places in the Philippines, they are very destructive, and the suggestions of Baker are commended to those who encounter them.

Current Literature in the March number will deal with work in Ceylon and the Malay States, where Pará rubber is the center of interest.